Title: Positron Emission Tomography (PET) Scanning: Oncologic Applications

See also:
- PET Scanning: Cardiac Applications
- PET Scanning: In Oncology to Detect Early Response during Treatment
- PET Scanning: Miscellaneous (Non-cardiac, Non-oncologic) Applications

Professional
Original Effective Date: October 1, 1997
Revision Date(s): October 30, 2013; October 28, 2014; October 22, 2015; October 1, 2015; October 1, 2016; October 1, 2017; October 1, 2018
Current Effective Date: October 22, 2015

Institutional
Original Effective Date: September 11, 2004
Revision Date(s): October 30, 2013; October 28, 2014; October 22, 2015; October 1, 2015; October 1, 2016; October 1, 2017; October 1, 2018
Current Effective Date: October 22, 2015

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DESCRIPTION
Positron emission tomography (PET) scans are based on the use of positron-emitting radionuclide tracers coupled to organic molecules, such as glucose, ammonia, or water. The radionuclide tracers simultaneously emit 2 high-energy photons in opposite directions that can be simultaneously detected (referred to as coincidence detection) by a PET scanner, consisting of multiple stationary detectors that encircle the area of interest.

Background
A variety of tracers are used for PET scanning, including oxygen-15, nitrogen-13, carbon-11, and fluorine-18. Because of their short half-life, some tracers must be made locally using an onsite cyclotron. The radiotracer most commonly used in oncology imaging has been fluorine-18 coupled with fluorodeoxyglucose (FDG), which has a metabolism related to glucose metabolism. FDG has been considered useful in cancer imaging, since tumor cells show increased metabolism of glucose. The most common malignancies studied have been melanoma, lymphoma, lung, colorectal, and pancreatic cancer.

Important Note
This policy only addresses the use of radiotracers detected with the use of dedicated PET scanners. Radiotracers such as FDG may be detected using single-photon emission computerized tomography (SPECT) cameras, a technique that may be referred to as FDG-SPECT imaging. The use of SPECT cameras for PET radiotracers presents unique issues of diagnostic performance and is not considered in this policy.

Regulatory Status
In 1997, the FDA Modernization Act attempted to resolve the controversy regarding PET scans first by establishing FDA authority over the safety and effectiveness of locally manufactured radiotracers and second, by developing streamlined regulations for good manufacturing practices with which each PET facility must comply.

FDA issued a notice in the Federal Register on March 10, 2000, summarizing the regulatory history of PET radiotracers and highlighting its decisions on safety and effectiveness for certain uses of certain PET radiotracers. FDA conducted a literature review and Advisory Committee meetings to discuss the following uses:

- $^{18}$F-FDG for evaluation of glucose metabolism in oncology
- $^{18}$F-FDG for evaluation of myocardial hibernation
- $^{13}$N-ammonia for evaluation of myocardial blood flow
- $^{15}$O-water for assessment of cerebral perfusion

However, only the first 3 of these were subsequently approved by FDA. In September 2012, FDA approved choline C-11 for PET imaging in patients with suspected prostate cancer recurrence (ie, elevated serum prostate-specific antigen after initial therapy) in whom bone scintigraphy, CT, or MRI is noninformative. Potential sites of prostate cancer
recurrence identified on choline C-11 PET scanning require subsequent histologic confirmation.\textsuperscript{1}

A draft guidance document for Current Good Manufacturing Practice (CGMP) requirements for the production of PET drug products was issued on April 1, 2002. The final CGMP regulation was issued on December 9, 2009, and took effect on December 12, 2011.

The following FDA web page includes various PET-related documents:
http://www.fda.gov/Drugs/DevelopmentApprovalProcess/Manufacturing/ucm085783.htm

\textbf{POLICY}

- All policy statements apply to both positron emission tomography (PET) scans and PET/computed tomography (CT) scans, ie, PET scans with or without PET/CT fusion.
- For the clinical situations indicated that may be considered medically necessary, this is with the assumption that the results of the PET scan will influence treatment decisions. If the results will not influence treatment decisions, these situations would be considered not medically necessary.

\textbf{A. Bone Cancer}
1. PET scanning may be considered \textit{medically necessary} in the staging of Ewing sarcoma and osteosarcoma.
2. PET scanning is considered \textit{experimental / investigational} in the staging of chondrosarcoma.

\textbf{B. Breast Cancer}
1. PET scanning may be considered \textit{medically necessary} in the staging and restaging of breast cancer for the following application:
   a. Detecting locoregional or distant recurrence or metastasis (except axillary lymph nodes) when suspicion of disease is high and other imaging is inconclusive.
2. PET scanning is considered \textit{experimental / investigational} in the evaluation of breast cancer for all other applications, including but not limited to the following:
   a. Differential diagnosis in patients with suspicious breast lesions or an indeterminate/low suspicion finding on mammography
   b. Staging axillary lymph nodes.
   c. Predicting pathologic response to neoadjuvant therapy for locally advanced disease.

\textbf{C. Cervical Cancer}
1. PET scanning may be considered \textit{medically necessary} in the initial staging of patients with locally advanced cervical cancer.
2. PET scanning may be considered \textit{medically necessary} in the evaluation of known or suspected recurrence.
D. Colorectal Cancer
1. PET scanning may be considered medically necessary as a technique for:
   a. Staging and restaging to detect and assess resectability of hepatic or extrahepatic metastases of colorectal cancer, and
   b. To evaluate a rising and persistently elevated carcinoembryonic antigen (CEA) level when standard imaging, including CT scan, is negative.
2. PET scanning is considered experimental/investigational as:
   a. A technique to assess the presence of scarring versus local bowel recurrence in patients with previously resected colorectal cancer.
   b. A technique contributing to radiotherapy treatment planning.

E. Esophageal Cancer
1. PET scanning may be considered medically necessary in the:
   a. Staging of esophageal cancer, and
   b. Determining response to preoperative induction therapy.
2. PET scanning is considered experimental/investigational in other aspects of the evaluation of esophageal cancer, including but not limited to the following applications:
   a. Detection of primary esophageal cancer.

F. Gastric Cancer
1. PET scanning may be considered medically necessary in the:
   a. Initial diagnosis and staging of gastric cancer.
   b. Evaluation for recurrent gastric cancer after surgical resection, when other imaging modalities are inconclusive.

G. Head and Neck Cancer
1. PET scanning may be considered medically necessary in the evaluation of head and neck cancer in the diagnosis of suspected cancer, initial staging of disease, and restaging of residual or recurrent disease during follow-up.

H. Lung Cancer
1. PET scanning may be considered medically necessary for any of the following applications:
   a. Patients with a solitary pulmonary nodule as a single scan technique (not dual-time) to distinguish between benign and malignant disease when prior CT scan and chest x-ray findings are inconclusive or discordant,
   b. As staging or restaging technique in those with known non-small-cell lung cancer, and
   c. To determine resectability for patients with a presumed solitary metastatic lesion from lung cancer.
2. PET scanning is considered experimental/investigational in staging of small cell lung cancer.

I. Lymphoma, Including Hodgkin Disease
1. PET scanning may be considered medically necessary as a technique for staging lymphoma either during initial staging or for restaging at follow-up.
J. Melanoma
1. PET scanning may be considered medically necessary as a technique for assessing extranodal spread of malignant melanoma at initial staging or at restaging during follow-up treatment.
2. PET scanning is considered experimental / investigational as a technique to detect regional lymph node metastases in patients with clinically localized melanoma who are candidates to undergo sentinel node biopsy.

K. Ovarian Cancer
1. PET scanning may be considered medically necessary in the evaluation of patients with signs and/or symptoms of suspected ovarian cancer recurrence (restaging) when standard imaging, including CT scan, is inconclusive.
2. PET scanning is considered experimental / investigational in the initial evaluation of known or suspected ovarian cancer in all situations.

L. Pancreatic Cancer
1. PET scanning may be considered medically necessary in the initial diagnosis and staging of pancreatic cancer when other imaging and biopsy are inconclusive.
2. PET scanning is considered experimental / investigational as a technique to evaluate other aspects of pancreatic cancer.

M. Soft Tissue Sarcoma
1. PET scanning is considered experimental / investigational in evaluation of soft tissue sarcoma, including but not limited to the following applications:
   a. Distinguishing between benign lesions and malignant soft tissue sarcoma
   b. Distinguishing between low grade and high grade soft tissue sarcoma
   c. Detecting locoregional recurrence
   d. Detecting distant metastasis
   e. Evaluating response to imatinib and other treatments for gastrointestinal stromal tumors.

N. Testicular Cancer
1. PET scanning may be considered medically necessary in evaluation of residual mass following chemotherapy of stage IIB and IIII seminomas. (The PET scan should be completed not sooner than 6 weeks after chemotherapy.)
2. Except as noted above for seminoma, PET scanning is considered experimental / investigational in evaluation of testicular cancer, including but not limited to the following applications:
   a. Initial staging of testicular cancer
   b. Distinguishing between viable tumor and necrosis/fibrosis after treatment of testicular cancer
   c. Detection of recurrent disease after treatment of testicular cancer
O. **Thyroid Cancer**
   1. PET scanning may be considered **medically necessary** in the restaging of patients with differentiated thyroid cancer when thyroglobulin (Tg) levels are elevated and whole-body iodine-131 imaging is negative.
   2. PET scanning is considered **experimental / investigational** in the evaluation of known or suspected differentiated or poorly differentiated thyroid cancer in all other situations.

P. **Unknown Primary**
   1. PET scanning may be considered **medically necessary** in patients with an unknown primary who meet ALL of the following criteria:
      a. In patients with a single site of disease outside the cervical lymph nodes; AND
      b. Patient is considering local or regional treatment for a single site of metastatic disease; AND
      c. After a negative workup for an occult primary tumor; AND
      d. PET scan will be used to rule out or detect additional sites of disease that would eliminate the rationale for local or regional treatment.
   2. PET scanning is considered **experimental / investigational** for other indications in patients with an unknown primary, including, but not limited to the following:
      a. As part of the initial workup of an unknown primary
      b. As part of the workup of patients with multiple sites of disease

Q. **Cancer Surveillance**
   1. PET scanning is considered **experimental / investigational** when used as a surveillance tool for patients with cancer or with a history of cancer. A scan is considered surveillance if performed more than 6 months after completion of cancer therapy (12 months for lymphoma) in patients without objective signs or symptoms suggestive of cancer recurrence (see Policy Guidelines section).

R. **Other Oncologic Applications**
   1. Other oncologic applications of PET scanning, including but not limited to the following, are considered **experimental / investigational**:
      a. Diagnosis and management of known or suspected prostate cancer
      b. Diagnosis of brain tumors
      c. Staging of multiple myeloma
      d. Evaluation of neuroendocrine tumors
      e. Staging inguinal lymph nodes in patients with squamous cell carcinoma of the penis.
Policy Guidelines
1. For this policy, PET scanning is discussed for the following 4 applications in oncology.
   a. Diagnosis
      Diagnosis refers to use of PET as part of the testing used in establishing whether or not a patient has cancer.
   b. Staging
      This refers to use of PET to determine the stage (extent) of the cancer at the time of diagnosis, before any treatment is given. Imaging at this time is generally to determine whether or not the cancer is localized. This may also be referred to as initial staging.
   c. Restaging
      This refers to imaging following treatment in 2 situations.
      1) Restaging is part of the evaluation of a patient in whom a disease recurrence is suspected based on signs and/or symptoms.
      2) Restaging also includes determining the extent of malignancy after completion of a full course of treatment.
   d. Surveillance
      This refers to use of imaging in asymptomatic patients (patients without objective signs or symptoms of recurrent disease). This imaging is completed 6 months or more (12 months or more for lymphoma) following completion of treatment.

2. As with any imaging technique, the medical necessity of PET scanning depends in part on what imaging techniques are used either before or after the PET scanning. Due to its expense, PET scanning is typically considered after other techniques, such as CT, magnetic resonance imaging (MRI), or ultrasonography, provide inconclusive or discordant results. In patients with melanoma or lymphoma, PET scanning may be considered an initial imaging technique. If so, the medical necessity of subsequent imaging during the same diagnostic evaluation is unclear. Thus, PET should be considered for the medically necessary indications above only when standard imaging, such as CT or MRI, is inconclusive or not indicated.

3. Use of PET scanning for surveillance as described in the policy statement and policy rationale refers to the use of PET to detect disease in asymptomatic patients at various intervals. This is not the same as the use of PET for detecting recurrent disease in symptomatic patients; these applications of PET are considered within tumor-specific categories in the policy statements.
RATIONALE
This policy is based on multiple evaluations of positron emission tomography (PET), including TEC Assessments, other systematic reviews, meta-analyses, decision analyses, and cost-effectiveness analyses. The most recent search of PubMed® covered the period through January 25, 2015.

From the perspective of evidence-based medicine, overall, the literature on use of PET scanning in oncology is quite limited. There are few rigorous studies that assess the impact of PET on clinical outcomes. Most of the studies that report on outcomes describe changes in staging and/or treatment that result from the PET scan; however, the studies do not evaluate whether these changes result in an improvement in the net health outcome.

A 1997 TEC Assessment considered the use of PET scanning in the evaluation of solitary pulmonary nodules and staging of known lung cancer. A 2006 evidence report by TEC for the Agency for Healthcare Research and Quality (AHRQ) addressed use of PET for staging small cell lung cancer (SCLC). Three 1999 TEC Assessments and 1 2000 TEC Assessment considered the use of PET scanning in the evaluation of melanoma, lymphoma, colorectal, and head and neck cancer. TEC Assessments from 2000 and 2002 addressed unknown primaries. A 2001 TEC Assessment, a 2002 decision analysis, and a 2005 systematic review focused on esophageal cancer. Pancreatic cancer was evaluated in a 1999 TEC Assessment and a 2004 AHRQ systematic review. The 2004 AHRQ systematic review also focused on ovarian cancer, as well as testicular cancer. Soft tissue sarcoma was the subject of a 2002 AHRQ systematic review. Breast cancer was the focus of 2 TEC Assessments from 2001 and 2003, a systematic review from 2005, a systematic review from 2007, and a cost-effectiveness analysis from 2005. Several uses of PET were reviewed in National Comprehensive Cancer Network (NCCN) Task Force documents released in 2007 and 2009. Another AHRQ systematic review evaluating use of PET for 9 cancers was published in 2008. Systematic reviews and meta-analyses published in 2011 and 2012 address 10 indications for 9 malignancies. In the Assessments, PET scanning was considered an adjunct to other imaging methods (ie, computed tomography [CT], magnetic resonance imaging [MRI], ultrasonography) often used when previous imaging studies are inconclusive or provide discordant results. In this setting, the clinical value of PET scans is the rate of discordance among imaging techniques and the percentage of time that PET scanning results in the correct diagnosis, as confirmed by tissue biopsy. The Assessments and other reviews offered the following observations and conclusions.

Bone Cancer
A systematic review and meta-analysis of studies examining the diagnostic accuracy of PET in Ewing sarcoma showed very high estimates of sensitivity and specificity (pooled sensitivity, 96%; pooled specificity, 92%). Another study of PET in pediatric sarcoma (Ewing sarcoma, osteosarcoma), in which PET was used in addition to conventional imaging, showed that PET was superior to conventional imaging in detecting lymph node and bone involvement. The most thorough assessment of cancer involvement used both PET and conventional tests and produced important changes in therapy decisions.

There are very few studies examining the utility of PET in chondrosarcoma.
Brain Tumors
A systematic review and meta-analysis addressed use of fluorine-18 fluoro-ethyl-tyrosine (FET) in detecting primary brain tumors. While it used a sophisticated meta-analytic method, it did not compare use of $^{18}$F-FET PET with another imaging modality for diagnosis of brain tumors, so no conclusions can be reached about comparative effectiveness. A 2013 meta-analysis found limited use for $^{18}$F-FDG-PET in differentiating brain tumors. Diagnostic performance was better with $^{11}$C-methionine PET. However, another meta-analysis found dynamic susceptibility contrast-enhanced MRI performed better than $^{11}$C-methionine PET in glioma recurrence detection.

Breast Cancer
The 2001 TEC Assessment focused on multiple applications of PET scanning in breast cancer, including characterization of breast lesions, staging axillary lymph nodes, detection of recurrence, and evaluating response to treatment. The 2003 TEC Assessment reexamined all of these indications except for its role in characterizing breast lesions.

- The bulk of the data regarding PET scanning for breast cancer focuses on its use as a technique to further characterize breast lesions such that patients could avoid biopsy of a mammographically indeterminate or suspicious lesion. The key statistic in this analysis is the false-negative rate, because patients with a false-negative result on a PET scan may inappropriately forgo a biopsy and subsequent treatment. The false-negative rate will vary with the underlying prevalence of the disease, but may range from 5.5% to 8.5%. Given the relative ease of breast biopsy, this false-negative rate may be considered unacceptable, and thus patients may undergo biopsy regardless of the results of a PET scan.

- A 2005 systematic review and meta-analysis focused on use of PET for detecting recurrence and metastases. The report concluded that PET is a valuable tool; however, it did not compare PET performance with that of other diagnostic modalities, so it is unclear whether PET results in different management decisions and health outcomes.

- A systematic review published in 2007 on use of PET for staging axillary lymph nodes identified 20 studies. Of these, 3 studies were rated highest quality, indicating broad generalizability to a variety of patients and no significant flaws in research methods. The remaining studies were more flawed and/or were more narrowly generalizable. The review observed that there was great variability in estimates of sensitivity and specificity from the selected studies and that it is difficult to draw conclusions from the evidence.

A 2013 meta-analysis by Hong et al reported sensitivity and specificity of PET/CT in diagnosing distant metastases in breast cancer patients of 0.96 (95% confidence interval [CI], 0.90 to 0.98) and 0.95 (95% CI, 0.92 to 0.97), respectively, when 8 studies totaling 748 patients were included. When the meta-analysis included 6 comparative studies totaling 664 patients, sensitivity and specificity were 0.97 (95% CI, 0.84 to 0.99) and 0.95 (95% CI, 0.93 to 0.97), compared with 0.56 (95% CI, 0.38 to 0.74) and 0.91(95% CI, 0.78 to 0.97) with conventional imaging.

Rong et al (2013) meta-analyzed 7 studies totaling 668 patients and reported that PET/computed tomography (CT) sensitivity and specificity were greater compared with bone scintigraphy for detecting bone metastasis in breast cancer patients. PET/CT sensitivity and specificity were 0.93 (95% CI, 0.82 to 0.98) and 0.99 (95% CI, 0.95 to 1.00), respectively, compared with 0.81 (95% CI, 0.58 to 0.93) and 0.96 (95% CI, 0.76 to 1.00), respectively, for bone scintigraphy.
In a meta-analysis of 8 studies (total N=873) of FDG-PET in women with suspicious breast lesions, Caldarella et al (2014) reported pooled sensitivity and specificity of 0.85 (95% CI, 0.83 to 0.88) and 0.79 (95% CI, 0.74 to 0.83), respectively, on a per-lesion basis. As previously noted, a false-negative rate of 15% (1 – sensitivity) may be considered unacceptable given the relative ease of breast biopsy.

A 2007 National Comprehensive Cancer Network (NCCN) review of PET concluded that PET is optional and may be useful for staging and restaging regional or distant metastasis when suspicion is high and other imaging is inconclusive. Current NCCN guidelines include an optional category 2B recommendation for FDG-PET/CT in the work-up of clinical stage IIIA breast cancer. NCCN recommends against FDG-PET/CT for lower stage breast cancer due to high false-negative rates in detecting low-grade lesions or lesions less than 1 cm; low sensitivity in detecting axillary node metastasis; low prior probability of detectable metastases in these patients; and high false-positive rates. PET or PET/CT is considered most helpful when “standard staging studies are equivocal or suspicious, especially in the setting of locally advanced or metastatic disease.” Additionally, NCCN guidelines do not recommend routine use of PET scans in asymptomatic patients for surveillance and follow-up after breast cancer treatment.

Two 2012 meta-analyses pooled studies on use of FDG PET to predict pathologic response to neoadjuvant therapy before surgery for locally advanced breast cancer. These articles reported similar pooled point estimates of both sensitivity and specificity. They both concluded that PET has reasonably high sensitivity and relatively low specificity. Neither article described how PET should be used to influence patient management decisions and therefore whether health outcomes would be changed relative to decisions not based on PET results. Thus, it is unclear whether PET improves outcomes for predicting pathologic response to neoadjuvant therapy for locally advanced breast cancer.

**Cervical Cancer**

An AHRQ review published in 2008 identified several studies in which PET or PET/CT was used in the staging of advanced cervical cancer and for detection and staging of recurrent disease. The report concluded that most studies supported enhanced diagnostic accuracy, which would improve the selection of appropriate treatment for patients. For recurrent disease, PET identified additional sites of metastasis, which would alter treatment decisions in some cases. For example, in a 2004 study by Yen et al of 55 patients whose recurrences were initially considered curable with radical surgical treatment, 27 instead underwent palliative therapy based on PET results. An NCCN Task Force Report on PET also identified several studies that supported use of PET for initial staging and for identification and staging of recurrent disease.

In a 2013 meta-analysis of 9 cervical cancer recurrence studies, Meads et al reported sensitivity and specificity of PET/CT of 94.8 (95% CI, 91.2 to 96.9) and 96.9 (95% CI, 82.2 to 90.5), respectively. The authors found the quality of studies on recurrence was average with some limitations. For example, studies included mostly symptomatic women and did not differentiate between PET for diagnosis or surveillance. In a meta-analysis of 20 studies, Chu et al (2014) reported pooled sensitivity and specificity for FDG-PET or FDG-PET/CT of 0.87 (95% CI, 0.80 to 0.92) and 0.97 (95% CI, 0.96 to 0.98), respectively, for distant metastasis in recurrent cervical cancer. For local regional recurrence, pooled sensitivity and specificity were 0.82 (95% CI, 0.72 to 0.90) and 0.98 (95% CI, 0.96 to 0.99), respectively.
Current NCCN guidelines state that PET/CT “may aid in treatment planning but is not accepted for formal staging purposes.”47 A single PET/CT at 3 to 6 months after therapy for locally advanced cervical cancer is recommended to detect persistent or recurrent disease. PET/CT is not recommended for surveillance.

**Colorectal Cancer**

Two clinical applications of PET scanning were considered in the 1999 TEC Assessment: (1) To detect hepatic or extrahepatic metastases and to assess their resectability in patients with colorectal cancer, either as part of initial staging or after primary resection, and (2) to evaluate the presence of postoperative scar versus recurrent disease as a technique to determine the necessity of tissue biopsy.

- The body of evidence indicated that PET scanning added useful information to conventional imaging in detecting hepatic and extrahepatic metastases. In particular, PET detected additional metastases leading to more identification of nonresectable disease, allowing patients to avoid surgery. The strongest evidence comes from a study that directly assessed the additional value of PET. In a group of 37 patients thought to have a solitary liver metastasis by conventional imaging, PET correctly upstaged 4 patients and falsely overstaged 1 patient. This study and another further found that, when PET is discordant with conventional imaging, PET is correct in 88% and 97% of patients, respectively. When PET affected management decisions, it was more often used to recommend against surgery.

- When used to distinguish between local recurrence and scar, the comparison is between performing histologic sampling in all patients with a suspected local recurrence and avoiding sampling in patients whose PET scans suggest the presence of postoperative scar. The key concern is whether the negative predictive value (NPV) for PET is sufficiently high to influence decision making, specifically to avoid tissue biopsy when the PET scan is negative. The available studies suggested a probability of false-negative results of 8%, making it unlikely that patients and physicians would be willing to forgo histologic sampling and delay potentially curative repeat resection.

- A systematic review of different imaging techniques for radiotherapy treatment planning of rectal cancer concluded that additional studies are needed to validate use of PET in this setting.26 Three systematic reviews published in 2014 included overlapping studies that assessed the predictive value of FDG-PET/CT in patients with locally advanced rectal cancer who received neoadjuvant chemoradiotherapy.48-50 Various PET parameters were investigated (standardized uptake value [SUV], response index [percentage of SUV decrease from baseline to post-neoadjuvant treatment]), and cutoff values varied. Pooled sensitivities ranged from 0.74 to 0.82, and pooled specificities ranged from 0.64 to 0.85. The value of FDG-PET/CT in this setting has yet to be clarified.

In a 2013 meta-analysis, Lu et al evaluated 510 patients from 11 studies on PET for colorectal cancer tumor recurrence detection in patients with carcinoembryonic antigen (CEA) elevation.51 FDG-PET and PET/CT pooled sensitivity estimates were 90.3% (95% CI, 85.5% to 94.0%) and 94.1% (95% CI, 89.4% to 97.1%), respectively, and specificities were 80.0% (95% CI, 67.0% to 89.6%) and 77.2% (95% CI, 66.4% to 85.9%), respectively.

Current NCCN guidelines for colon cancer “strongly discourage the routine use of PET/CT scanning for staging, baseline imaging, or routine follow-up and recommend consideration of a preoperative PET/CT scan at baseline only if prior anatomic imaging indicates the presence of...
potentially surgically curable M1 disease. NCCN panel opinion was divided on appropriateness of PET/CT when CEA level is rising; PET/CT may be considered when imaging study results (eg, a good quality CT scan) are normal.

Current NCCN guidelines for rectal cancer state that PET/CT is “not routinely indicated” and “should only be used to evaluate an equivocal finding on a contrast-enhanced CT scan.”

**Esophageal Cancer**

Regarding initial diagnosis, PET is generally not considered a test for detecting primary esophageal tumors, and evidence is lacking on its use to differentiate between esophageal cancer and benign conditions.

A 2009 NCCN Task Force report found studies showing that PET is more sensitive than other diagnostic imaging in detecting stage IV disease with distant lymph node involvement. A meta-analysis described in the report found a 0.67 pooled sensitivity, 0.97 specificity, and small added value after conventional staging in detecting distant metastasis. In a 2013 meta-analysis of 245 patients with esophageal cancer from 6 studies, Shi et al reported that for detection of regional nodal metastases, FDG PET/CT had a sensitivity of 0.55 (95% CI, 0.34 to 0.74) and specificity of 0.76 (95% CI, 0.66 to 0.83). Current NCCN guidelines for esophageal cancer indicate that PET/CT may be considered in the initial workup of esophageal cancer if there is no evidence of M1 disease and to assess response to preoperative or definitive chemoradiation.

Another use of PET in esophageal cancer is in determining whether to continue chemotherapy for potential curative resection. The NCCN Task Force report described several studies in which response to chemotherapy, defined as a decline in standardized uptake values, correlated with long-term survival. Patients who do not respond to chemotherapy may benefit from this test by being spared futile and toxic chemotherapy. However, the treatment strategy of PET-directed chemotherapy does not appear to have been validated with randomized controlled trials (RCTs) showing improved net health outcome. Current NCCN guidelines for esophageal cancer state that PET/CT may be considered to assess treatment response 5 to 6 weeks after preoperative therapy.

**Gastric Cancer**

A systematic review and meta-analysis pooled 9 studies of PET for evaluating recurrent gastric cancer. The meta-analysis used methods that do not adequately account for dependence of sensitivity and specificity, nor did the authors adequately handle covariates that might explain between-study heterogeneity. The authors concluded that PET combined with CT may be more effective than either modality alone, but the data presented do not support this conclusion. In a 2013 meta-analysis, the sensitivity of PET/CT for detecting recurrence of gastric cancer after surgical resection was 0.86 (95% CI, 0.71 to 0.94), and specificity was 0.88 (95% CI, 0.75 to 0.94).

Current NCCN guidelines for gastric cancer indicate that PET/CT (but not PET alone) may be used as part of an initial workup if there is no evidence of metastatic disease. The guidelines note that the sensitivity of PET/CT is lower than CT, but specificity is higher, and PET/CT adds value to the diagnostic workup. NCCN guidelines also indicate that PET/CT may be used to evaluate response to treatment.
Head and Neck Cancer
Among the 3 studies identified in the TEC Assessment that used other diagnostic modalities to attempt to identify a primary tumor in patients with positive cervical lymph nodes, PET found more primary tumors compared with other modalities in 2 studies and identified similar proportions in 1 study. When data from these 3 studies were pooled, PET was found to identify tumor in 38% of cases and other modalities found tumor in 21% of cases.

- When PET was used to initially stage cervical lymph nodes (ie, status of the cervical nodes was unknown), the addition of PET to other imaging modalities increased the proportion of patients who were correctly staged, as confirmed histologically. When compared head to head with other imaging modalities, pooled data from a variety of studies suggested that PET had a better diagnostic performance compared with CT and MRI.

- Of 8 studies focusing on the use of PET to detect residual or recurrent disease, 5 found PET to be more specific and sensitive, 2 reported mixed or equivalent results, and 1 reported worse results compared with CT.

Meta-analyses in 2013 and 2014 reported good sensitivities and specificities with PET/CT for diagnosing head and neck squamous cell cancers (better than CT and MRI) and for detecting head and neck cancer metastases (better than bone scintigraphy and recurrence). Current NCCN guidelines for head and neck cancer indicate that PET/CT may be appropriate for stage III-IV disease evaluation, for detection of metastases or recurrence, and for evaluation of response to treatment.

Lung Cancer
PET scanning may have a clinical role in patients with solitary pulmonary nodules in whom the diagnosis is uncertain after CT scan and chest radiograph. Younger patients who have no smoking history have a relatively low risk for lung cancer, and in this setting, the NPV of a PET scan is relatively high. If presented with a negative PET scan and information about the very low probability of undetected malignancy, it is quite likely that some patients would choose to avoid the harms of an invasive sampling procedure (ie, biopsy). A meta-analysis on evaluating pulmonary nodules using dual-time PET (a second scan added after a delay) found that its additive value relative to a single PET scan is questionable.

In patients with known non-SCLC, the clinical value of PET scanning relates to improved staging information regarding the involvement of mediastinal lymph nodes, which generally excludes patients from surgical excision. The 1997 TEC Assessment cited a decision analysis that suggested that use of CT plus PET scanning in staging mediastinal lymph nodes resulted in fewer surgeries and an average gain in life expectancy of 2.96 days. The gain in life expectancy suggests that avoidance of surgery was not harmful to the patients in that potentially beneficial surgery was not withheld on the basis of false-positive imaging results.

A 2009 NCCN report on the use of PET scanning supported an indication for patients who are suspected to have solitary metastases who may be candidates for surgical resection. In such patients, the test may detect additional metastases, which would rule out or change the extent of planned surgery.

Six studies of patients with SCLC reported evidence suggesting that for nonbrain metastases, PET added to conventional staging is more sensitive in detecting disease compared with conventional staging alone. PET may correctly upstage and downstage disease, and studies reported very
high occurrence of patient management changes that were attributed to PET. However, the quality of these studies is consistently poor, and insufficient detail in reporting was the norm, especially with respect to the reference standard. A systematic review of staging SCLC found PET to be more effective than conventional staging methods; however, this review was heavily flawed by not conducting a quality assessment of individual studies, so its conclusions may not be sound.28 A 2014 meta-analysis included 12 studies (total N=369) of FDG-PET/CT for staging SCLC.62 Although estimated pooled sensitivity and pooled specificity were 0.98 (95% CI, 0.94 to 0.99) and 0.98 (95% CI, 0.95 to 1.00), included studies were small (median sample size, 22 patients); of primarily fair to moderate quality; and heterogeneous in design (retrospective, prospective), PET parameter assessed, indication for PET, and reference standard used. It is not possible from the limited and poor quality evidence that is available to determine whether use of PET adds value relative to conventional staging tests for SCLC.

Meta-analyses in 2013 have reported good sensitivities and specificities in lung cancer detection with PET/CT.63,64

The American College of Chest Physicians issued guidelines for the diagnosis and management of lung cancer in 2013.65 The guidelines state that RCTs support the use of PET or PET/CT scanning as a component of lung cancer treatment and recommend PET or PET/CT for staging, detection of metastases, and avoidance of noncurative surgical resections.

Current NCCN guidelines for non-SCLC indicate that PET may be used in the staging of disease, detection of metastases, treatment planning, and detection of disease recurrence.66 However, PET is not recommended for detection of brain metastasis from lung cancers. Current NCCN guidelines for SCLC indicate PET may be used in the staging of disease and treatment planning but “is not recommended for routine follow-up.”67

**Lymphoma, Including Hodgkin Disease**

Of the 14 available studies reviewed in the 1999 TEC Assessment,5 3 compared PET with anatomic imaging in initial staging and restaging of patients with Hodgkin disease and non-Hodgkin lymphoma. Two of these studies included data from both diseased and nondiseased sites for PET and CT. Both studies found PET to have better overall diagnostic accuracy than CT. The third study addressed detection of diseased sites only and found PET to have similar sensitivity as CT or MRI. Among the 6 studies that reported on concordance between PET and other imaging modalities, PET was discordant with other modalities in 11% to 50%; PET was correct among discordances in 40% to 75%. PET has been reported to affect patient management decisions in 8% to 20% of patients in 5 studies, mainly by correctly upstaging disease, but also by correctly downstaging disease. Thus, when PET is added to conventional imaging, it can provide useful information for selecting effective treatment that is appropriate to the correct stage of disease.

Meta-analyses in 2013 reported good sensitivities and specificities with PET/CT in the detection of newly diagnosed Hodgkin lymphoma68 and diffuse large B-cell lymphoma.69

Current NCCN guidelines for Hodgkin lymphoma70 and non-Hodgkin lymphomas71 indicate that PET/CT may be used in staging, restaging, and evaluating treatment response.
Melanoma
Surgical resection for melanoma is limited to those with local disease. Patients with widespread disease are not candidates for resection. Frequently, there is microscopic spread to the proximal lymph nodes. Therefore, patients with a high risk of nodal spread, as assessed by the thickness of the primary melanoma, may be candidates for lymph node sampling, termed sentinel node biopsy. PET scanning has been investigated both as a technique to detect widespread disease as part of an initial staging procedure, and also to evaluate the status of local lymph nodes to determine the necessity of sentinel node biopsy.

To consider PET a useful alternative to sentinel node biopsy, it must have high sensitivity and specificity when either sentinel node biopsy or lymph node dissection serves as the reference standard. In the only study of this kind, PET had a sensitivity of only 17%, suggesting that PET rarely detected small metastases that can be discovered by sentinel node biopsy. Thus, the TEC Assessment concluded that PET is not as beneficial as sentinel node biopsy for assessing regional lymph nodes.4

The intent of using PET to detect extranodal metastases is to aid in selecting treatment appropriate to the patient's extent of disease. For example, surgical resection is typically not appropriate for widespread disease. A prospective blinded study of 100 patients found that PET was much more sensitive and specific than conventional imaging. Another prospective study of 76 patients found that, compared with CT, PET had much higher sensitivity and equivalent specificity. A third comparative study of 35 patients found that PET was much more sensitive than CT. It may be inferred from these studies that PET was usually correct when discordant with other modalities. PET affects management in approximately 18% of patients.

In meta-analysis of 9 studies (total N=623), Rodriquez Rivera et al reported pooled sensitivity and specificity of FDG-PET for detecting systemic metastases in patients with stage III cutaneous melanoma of 0.89 (95% CI, 0.65 to 0.98) and 0.89 (95% CI, 0.77 to 0.95), respectively.72

Current NCCN guidelines for melanoma indicate that PET/CT may be used for staging and restaging for more advanced disease, such as stage III, in the presence of specific signs and symptoms. PET/CT is not recommended for stage I or II disease.73 PET/CT also is listed as an option for surveillance screening for recurrent or metastatic disease.

Multiple Myeloma
Two systematic reviews, one of which also conducted a meta-analysis, addressed PET for staging of multiple myeloma.27,33 Neither report compared the diagnostic performance of PET with other imaging modalities, so they do not support conclusions about comparative effectiveness.

Neuroendocrine Tumors
Two meta-analyses from the same investigators addressed use of PET in patients with neuroendocrine tumors (NETs).30,31 One report included patients with thoracic and gastroenteropancreatic NETs who had imaging with PET using gallium 68-somatostatin receptor radiotracers.30 The other report included studies of paragangliomas scanned by PET with fluorine-18-dihydroxyphenylalanine.31 Neither study compared PET with other imaging modalities, precluding conclusions about comparative diagnostic performance.
Ovarian Cancer
For primary evaluation, ie, in patients with suspected ovarian cancer, the ability to rule out malignancy with a high NPV would change management by avoiding unnecessary exploratory surgery. However, available studies suggest that PET scanning has poorer NPV compared with other options, including transvaginal ultrasound (TVUS), Doppler studies, or MRI. Adding PET scanning to TVUS or MRI did not improve results.

Positive predictive value (PPV) is of greatest importance in evaluating patients with known ovarian cancer, either to detect disease recurrence or progression or to monitor response to treatment. Although the 2004 AHRQ systematic review suggested that PET may have value for detecting recurrence when CA125 is elevated and conventional imaging does not clearly show recurrence, this had not been demonstrated in an adequately powered prospective study. A 2008 AHRQ systematic review found that evidence supported the use of PET/CT for detecting recurrent ovarian cancer. Evidence for initial diagnosis and staging of ovarian cancer was still inconclusive.

A 2013 meta-analysis found PET/CT was useful for detecting ovarian cancer recurrence. American College of Radiology Appropriateness Criteria, also issued in 2013, indicated that PET/CT is appropriate for detecting and restaging ovarian cancer recurrence. Current NCCN guidelines for ovarian cancer indicate that PET/CT may be appropriate “for indeterminate lesions if results will alter management.” PET/CT also may be appropriate if clinically indicated after complete remission, for follow-up and to monitor for recurrence.

Pancreatic Cancer
Both the 2004 AHRQ systematic review and the 1999 TEC Assessment focused on 2 clinical applications of PET scanning in patients with known or suspected pancreatic cancer: the use of PET to distinguish between benign or malignant pancreatic masses, and the use of PET as a staging technique in patients with known pancreatic cancer.

- In terms of distinguishing between benign and malignant disease, the criterion standard is percutaneous or open biopsy. If PET were to be used to allow patients with scans suggesting benign masses to avoid biopsy, a very high NPV would be required. The key statistic underlying the NPV is the false-negative rate. Patients with false-negative results are incorrectly assumed to have benign disease and thus are not promptly treated for pancreatic cancer. Based on the literature review, NPV ranged between 75% and 92%, depending on an underlying prevalence of disease ranging from 50% to 75%. The TEC Assessment concluded that this level of diagnostic performance would not be adequate to recommend against biopsy. The 2004 AHRQ report found that PET was sometimes found to be more accurate than other modalities, but the meta-analysis showed that it is unclear whether PET’s diagnostic performance surpasses decision thresholds for biopsy or laparotomy.

- In both the TEC Assessment and AHRQ systematic review, data were inadequate to permit conclusions regarding the role of PET scanning as a technique to stage known pancreatic cancer.

In meta-analysis of 9 studies (total N=526), Rijkers et al (2014) reported pooled sensitivity and specificity of FDG-PET/CT for confirming suspected pancreatic cancer of 0.90 (95% CI, 0.87 to 0.93) and 0.76 (95% CI, 0.66 to 0.84), respectively. A 2008 AHRQ review and past NCCN guidelines for pancreatic carcinoma suggested that PET/CT may be useful for staging in certain
patients when the standard staging protocol is inconclusive.\textsuperscript{21,22} Current NCCN guidelines state that “the role of PET/CT remains unclear. [PET/CT] may be considered after formal pancreatic CT protocol in high-risk patients to detect extra pancreatic metastasis.”\textsuperscript{278}

**Penile Cancer**

A systematic review and meta-analysis of PET focused on staging inguinal lymph nodes among patients with penile squamous cell carcinoma. No comparisons were made with other imaging modalities. The report found that PET had low sensitivity, and the authors concluded that PET is not suited for routine clinical use in this setting.\textsuperscript{29}

**Prostate Cancer**

Both a 2009 NCCN Task Force Report\textsuperscript{21} and a 2008 AHRQ systematic review\textsuperscript{22} did not find sufficient evidence to support the use of PET for any indication in patients with prostate cancer. Reports showed significant overlap between benign prostatic hyperplasia, malignant tumor, local recurrence, and postoperative scarring. PET may have limited sensitivity in detecting distant metastatic disease. The AHRQ report identified only 4 studies of PET for the indications of restaging and recurrence, none of which addressed the effect of PET on management decisions.

In a 2013 meta-analysis by Umbehr et al of 10 studies (total N=637) of initial prostate cancer evaluation, pooled sensitivity was 0.84 (95% CI, 0.68 to 0.93), and specificity was 0.79 (95% CI, 0.53 to 0.93).\textsuperscript{79} In meta-analysis of 12 studies (total N=1055) of patients with biochemical failure after local treatment, pooled sensitivity was 0.85 (95% CI, 0.79 to 0.89), and specificity was 0.88 (95% CI, 0.73 to 0.95).

In a 2014 meta-analysis by von Eyben and Kairemo, pooled sensitivity and specificity of choline PET/CT for detecting prostate cancer recurrence in 609 patients was 0.62 (95% CI, 0.51 to 0.66) and 0.92 (95% CI, 0.89 to 0.94), respectively.\textsuperscript{80} In an evaluation of 280 patients from head-to-head studies comparing choline PET/CT with bone scans, PET/CT identified metastasis significantly more often than did bone scanning (127 [45%] vs 46 [16%], respectively; odds ratio, 2.8; 95% CI, 1.9 to 4.1; p<0.001). The authors also reported that choline PET/CT changed treatment in 381 (41%) of 938 patients. Complete prostate-specific antigen (PSA) response occurred in 101 (25%) of 404 patients.

Mohsen et al (2013) conducted a meta-analysis of 23 studies on C-11-acetate PET imaging for primary or recurrent prostate cancer.\textsuperscript{81} Pooled sensitivity for primary tumor evaluation was 0.75 (95% CI, 0.70 to 0.80), and pooled specificity was 0.76 (95% CI, 0.72 to 0.79). For detection of recurrence, pooled sensitivity was 0.64 (95% CI, 0.59 to 0.69), and pooled specificity was 0.93 (95% CI, 0.83 to 0.98). Although study quality was considered poor, low sensitivities and specificities appeared to limit the utility of C-11-acetate imaging in prostate cancer. C-11-acetate is not currently FDA-approved.

Current NCCN guidelines for prostate cancer indicate that C-11-choline PET may be considered for biochemical failure after primary treatment, ie, radiotherapy or radical prostatectomy, although further study is needed to determine the best use of this imaging modality in men with prostate cancer.\textsuperscript{82} FDG or fluoride PET should not be used routinely, for initial assessment or in other settings, due to limited evidence of clinical utility.
The European Association of Urology guidelines for prostate cancer indicate that C-11-choline PET/CT has limited value unless PSA levels exceed 1.0 ng/mL. In meta-analysis of 14 studies (total N=1667) of radiolabelled choline PET/CT for restaging prostate cancer, Treglia et al (2014) reported a maximum pooled sensitivity of 0.77 (95% CI, 0.71 to 0.82) in patients with PSA rate of increase greater than 2 ng/mL per year. Pooled sensitivity was lower for patients with PSA rate of increase less than 2 ng/mL per year or with PSA doubling time of 6 months or less. In meta-analysis of 11 studies (total N=609) of radiolabelled choline PET/CT for staging or restaging prostate cancer, Von Eyben et al (2014) reported pooled sensitivity and specificity of 0.59 (95% CI, 0.51 to 0.66) and 0.92 (95% CI, 0.89 to 0.94), respectively. Pooled PPV and NPV were 0.70 and 0.85, respectively.

Recent meta-analyses do not report strong evidence for the use of PET or PET/CT in the initial staging or management of prostate cancer or in the evaluation of possible recurrence related to biochemical failure. Studies evaluated contained large heterogeneity including the use of different radiotracers and PET with and without CT. Pooled sensitivities and specificities for the use of PET in initial prostate cancer treatment are generally low with wide ranges reported. While pooled sensitivities and specificities reported may be higher for PET for the detection of prostate cancer recurrence, further studies are needed for comparison of PET and PET/CT with other imaging techniques, such as MRI and radionuclide bone scan.

**Soft Tissue Sarcoma**

A 2002 AHRQ systematic review on the use of PET for soft tissue sarcoma evaluated 5 applications: distinguishing between benign lesions and malignant soft tissue sarcoma, distinguishing between low-grade and high-grade soft tissue sarcoma, detecting locoregional recurrence, detecting distant metastases, and evaluating response to therapy.

- The review found that PET had low diagnostic accuracy in distinguishing low-grade tumors from benign lesions. PET performed better at differentiating high- or intermediate-grade tumors from low-grade tumors; however, it is unclear whether this will have an impact on management decisions and health outcomes. Evidence is insufficient on the comparative diagnostic performance of PET and alternative diagnostic modalities in the diagnosis of soft tissue sarcoma, detection of locoregional recurrence, detection of distant metastasis, and evaluation of treatment response.

A systematic review looked at PET for evaluating response to imatinib and other treatments for gastrointestinal stromal tumors. The report lacked a fundamental feature of well-performed systematic review: appraisal of the methodologic quality of individual studies. The review also lacked comparison between decision making and outcomes with PET-guided management and management guided without PET.

**Testicular Cancer**

The 2004 AHRQ systematic review found 1 prospective study and 4 retrospective studies that generally showed higher sensitivity and specificity for PET compared with CT. However these studies were small in size and failed to report separate results for patients with seminoma versus those with nonseminoma. Studies also failed to report separate results by clinical stage of disease. Thus, it is unclear whether this evidence translates to changes in patient management and improved health outcomes.

- Studies on PET’s ability to discriminate viable tumor and necrosis/fibrosis after treatment of testicular cancer were flawed in 2 main ways. First, most studies did not compare the...
diagnostic accuracy of PET with other imaging modalities. Second, studies that did compare PET and CT did not state a clear threshold for a positive CT test, making study results difficult to interpret. Therefore, it is uncertain whether use of PET leads to different patient management decisions and health outcomes compared with other imaging modalities.

A 2008 AHRQ technology assessment and studies evaluating residual masses in patients after chemotherapy for seminoma support the use of PET. Current NCCN guidelines support the use of PET for this indication. PET is not recommended for nonseminoma patients.

**Thyroid Cancer, Differentiated**
The 2009 NCCN Task Force Report on PET reviewed studies that showed that PET can localize recurrent disease when other imaging tests are negative. Additionally, PET is prognostic in this setting: More metabolically active lesions on PET are strongly correlated with reduced survival. Current NCCN guidelines for thyroid carcinoma continue to support the use of FDG-PET/CT in thyroid cancer evaluations, such as when iodine-131 imaging is negative and stimulated thyroglobulin is greater than 2-5 ng/mL.

**Thyroid Cancer, Poorly Differentiated**
A meta-analysis of studies on detecting recurrent or metastatic medullary thyroid carcinoma did not compare PET with other imaging modalities and did not clearly perform quality assessment of individual studies or incorporate study quality concerns into conclusions. Current NCCN guidelines for thyroid carcinoma do not include PET or PET/CT in the management of medullary thyroid cancer.

**Unknown Primary**
The 2002 TEC Assessment concluded that FDG-PET met TEC criteria for the limited indication of the workup and management of patients with unknown primaries and a single site of metastatic disease. Specifically, local or regional therapy may be offered to these patients. In this setting, PET scanning may be used to verify the absence of disseminated disease.

- Regarding this application, the TEC Assessment identified 4 reports of 47 total patients who were referred for imaging of a single known metastatic site from an unknown primary. In 13 (28%) of these patients, PET scanning identified previously undetected metastases that were confirmed by biopsy. Therefore, the use of PET can contribute to optimal decision making regarding the appropriateness of local or regional therapy.

**Cancer Surveillance**
Clinical utility of PET scanning in surveillance, ie, in performing follow-up PET scans in asymptomatic patients to detect early disease recurrence, is not well-studied. (For this policy, a scan is considered a surveillance scan if performed more than 6 months after therapy [but 12 months for lymphoma].) The 2009 NCCN Task Force report stated, “PET as a surveillance tool should only be used in clinical trials.” Additionally, NCCN guidelines for various malignancies often note that PET scans are not recommended in asymptomatic patients. For example, current NCCN guidelines for breast cancer comment that PET scans (as well as many other imaging modalities) provide no advantage in survival or ability to palliate recurrent disease and are not recommended.
Other Malignancies
There are inadequate scientific data to permit conclusions regarding the role of PET scanning in other malignancies.

Summary of Evidence
The utility of positron emission tomography (PET) scanning for the diagnosis and staging of malignancies varies by specific type of cancer. In general, PET scanning can be useful for distinguishing benign from malignant masses in certain circumstances and for increasing the accuracy of staging by detecting additional disease not detected by other imaging modalities. Therefore, PET scanning for diagnosis and staging of malignancies can be considered medically necessary when specific criteria are met for specific cancers, as outlined in the policy statements. For follow-up after the initial diagnosis and staging has been performed, there are a few situations in which PET can improve detection of recurrence, which may lead to changes in management that improve net health outcome. For routine tumor surveillance, clinical utility is uncertain, and this use of PET scanning is considered investigational.

Practice Guidelines and Position Statements
Current National Comprehensive Cancer Network guidelines are summarized under each of the cancer headings above.

U.S. Preventive Services Task Force Recommendations
Not applicable.

CODING
The following codes for treatment and procedures applicable to this policy are included below for informational purposes. Inclusion or exclusion of a procedure, diagnosis or device code(s) does not constitute or imply member coverage or provider reimbursement. Please refer to the member’s contract benefits in effect at the time of service to determine coverage or non-coverage of these services as it applies to an individual member.

CPT/HCPCS
78608 Brain imaging, positron emission tomography (PET); metabolic evaluation
78609 Brain imaging, positron emission tomography (PET); perfusion evaluation
78811 Positron emission tomography (PET) imaging; limited area (e.g. Chest, head/neck)
78812 Positron emission tomography (PET) imaging; skull base to mid-thigh
78813 Positron emission tomography (PET) imaging; whole body
78814 Tumor imaging, positron emission tomography (PET) with concurrently acquired computed tomography (CT) for attenuation correction and anatomical localization; limited area (e.g. chest, head/neck)
78815 Tumor imaging, positron emission tomography (PET) with concurrently acquired computed tomography (CT) for attenuation correction and anatomical localization; skull base to mid-thigh
78816 Tumor imaging, positron emission tomography (PET) with concurrently acquired computed tomography (CT) for attenuation correction and anatomical localization; whole body
A9515 Choline C-11, diagnostic, per study dose up to 20 millicuries
A9526 Nitrogen N-13 ammonia, diagnostic, per study dose, up to 40 millicuries

Contains Public Information
A9552 Fluorodeoxyglucose F-18 FDG, diagnostic, per study dose, up to 45 millicuries
A9580 Sodium fluoride F-18, diagnostic, per study dose, up to 30 millicuries
A9587 Gallium ga-68, dotatate, diagnostic, 0.1 millicurie
A9588 Fluciclovine f-18, diagnostic, 1 millicurie
A9598 Positron emission tomography radiopharmaceutical, diagnostic, for non-tumor identification, not otherwise classified
G0219 PET imaging whole body; melanoma for noncovered indications
G0235 PET imaging, any site, not otherwise specified
G0252 PET imaging, full and partial-ring PET scanners only, for initial diagnosis of breast cancer and/or surgical planning for breast cancer (e.g., initial staging of axillary lymph nodes)

- A PET scan essentially involves 3 separate activities:
  1. manufacture of the radiopharmaceutical, which may be manufactured on site or manufactured at a regional delivery center with delivery to the institution performing PET;
  2. actual performance of the PET scan; and
  3. interpretation of the results.
- The following CPT codes are available to code for PET scans: 78608, 78609, 78811, 78812, 78813, 78814, 78815, 78816.
- The following are HCPCS codes specific to a few of the radiotracers used for PET: A9515, A9526, A9552, A9580, A9587, A9588, A9598.
- Two 2 new modifiers were added in July 2009. The modifiers are:
  - PI - Positron emission tomography (PET) or PET/computed tomography (CT) to inform the initial treatment strategy of tumors that are biopsy proven or strongly suspected of being cancerous based on other diagnostic testing, 1 per cancer diagnosis
  - PS - Positron emission tomography (PET) or PET/computed tomography (CT) to inform the subsequent treatment strategy of cancerous tumors when the beneficiary's treating physician determines that the PET study is needed to inform subsequent anti-tumor strategy

**ICD-10 Diagnosis Codes**

- C04.0 Malignant neoplasm of anterior floor of mouth
- C04.1 Malignant neoplasm of lateral floor of mouth
- C04.8 Malignant neoplasm of overlapping sites of floor of mouth
- C05.0 Malignant neoplasm of hard palate
- C05.1 Malignant neoplasm of soft palate
- C05.2 Malignant neoplasm of uvula
- C05.8 Malignant neoplasm of overlapping sites of palate
- C06.0 Malignant neoplasm of cheek mucosa
- C06.1 Malignant neoplasm of vestibule of mouth
- C06.2 Malignant neoplasm of retromolar area
- C06.89 Malignant neoplasm of overlapping sites of other parts of mouth
- C09.0 Malignant neoplasm of tonsillar fossa
- C09.1 Malignant neoplasm of tonsillar pillar (anterior) (posterior)
- C09.8 Malignant neoplasm of overlapping sites of tonsil
- C10.0 Malignant neoplasm of vallecula
- C10.1 Malignant neoplasm of anterior surface of epiglottis
- C10.2 Malignant neoplasm of lateral wall of oropharynx
- C10.3 Malignant neoplasm of posterior wall of oropharynx
- C10.4 Malignant neoplasm of branchial cleft
- C10.8 Malignant neoplasm of overlapping sites of oropharynx
- C11.0 Malignant neoplasm of superior wall of nasopharynx
C11.1 Malignant neoplasm of posterior wall of nasopharynx
C11.2 Malignant neoplasm of lateral wall of nasopharynx
C11.3 Malignant neoplasm of anterior wall of nasopharynx
C11.8 Malignant neoplasm of overlapping sites of nasopharynx
C12 Malignant neoplasm of pyriform sinus
C13.0 Malignant neoplasm of postcricoid region
C13.1 Malignant neoplasm of aryepiglottic fold, hypopharyngeal aspect
C13.2 Malignant neoplasm of posterior wall of hypopharynx
C13.8 Malignant neoplasm of overlapping sites of hypopharynx
C14.2 Malignant neoplasm of Waldeyer's ring
C14.8 Malignant neoplasm of overlapping sites of lip, oral cavity and pharynx
C15.3 Malignant neoplasm of upper third of esophagus
C15.4 Malignant neoplasm of middle third of esophagus
C15.5 Malignant neoplasm of lower third of esophagus
C15.8 Malignant neoplasm of overlapping sites of esophagus
C16.0 Malignant neoplasm of cardia
C16.1 Malignant neoplasm of fundus of stomach
C16.2 Malignant neoplasm of body of stomach
C16.3 Malignant neoplasm of pyloric antrum
C16.4 Malignant neoplasm of pylorus
C16.5 Malignant neoplasm of lesser curvature of stomach, unspecified
C16.6 Malignant neoplasm of greater curvature of stomach, unspecified
C16.8 Malignant neoplasm of overlapping sites of stomach
C18.0 Malignant neoplasm of cecum
C18.1 Malignant neoplasm of appendix
C18.2 Malignant neoplasm of ascending colon
C18.3 Malignant neoplasm of hepatic flexure
C18.4 Malignant neoplasm of transverse colon
C18.5 Malignant neoplasm of splenic flexure
C18.6 Malignant neoplasm of descending colon
C18.7 Malignant neoplasm of sigmoid colon
C18.8 Malignant neoplasm of overlapping sites of colon
C19 Malignant neoplasm of rectosigmoid junction
C20 Malignant neoplasm of rectum
C21.1 Malignant neoplasm of anal canal
C21.2 Malignant neoplasm of cloacogenic zone
C21.8 Malignant neoplasm of overlapping sites of rectum, anus and anal canal
C25.0 Malignant neoplasm of head of pancreas
C25.1 Malignant neoplasm of body of pancreas
C25.2 Malignant neoplasm of tail of pancreas
C25.3 Malignant neoplasm of pancreatic duct
C25.4 Malignant neoplasm of endocrine pancreas
C25.7 Malignant neoplasm of other parts of pancreas
C25.8 Malignant neoplasm of overlapping sites of pancreas
C26.1 Malignant neoplasm of spleen
C26.9 Malignant neoplasm of ill-defined sites within the digestive system
C30.0 Malignant neoplasm of nasal cavity
C30.1 Malignant neoplasm of middle ear
C31.0 Malignant neoplasm of maxillary sinus
C31.1 Malignant neoplasm of ethmoidal sinus
C31.2 Malignant neoplasm of frontal sinus
C31.3 Malignant neoplasm of sphenoid sinus
C31.8 Malignant neoplasm of overlapping sites of accessory sinuses
C32.0 Malignant neoplasm of glottis
C32.1 Malignant neoplasm of supraglottis
C32.2 Malignant neoplasm of subglottis
C32.3 Malignant neoplasm of laryngeal cartilage
C32.8 Malignant neoplasm of overlapping sites of larynx
C33 Malignant neoplasm of trachea
C34.01 Malignant neoplasm of right main bronchus
C34.02 Malignant neoplasm of left main bronchus
C34.11 Malignant neoplasm of upper lobe, right bronchus or lung
C34.12 Malignant neoplasm of upper lobe, left bronchus or lung
C34.2 Malignant neoplasm of middle lobe, bronchus or lung
C34.31 Malignant neoplasm of lower lobe, right bronchus or lung
C34.32 Malignant neoplasm of lower lobe, left bronchus or lung
C34.81 Malignant neoplasm of overlapping sites of right bronchus and lung
C34.82 Malignant neoplasm of overlapping sites of left bronchus and lung
C34.91 Malignant neoplasm of unspecified part of right bronchus or lung
C34.92 Malignant neoplasm of unspecified part of left bronchus or lung
C40.01 Malignant neoplasm of scapula and long bones of right upper limb
C40.02 Malignant neoplasm of scapula and long bones of left upper limb
C40.11 Malignant neoplasm of short bones of right upper limb
C40.12 Malignant neoplasm of short bones of left upper limb
C40.21 Malignant neoplasm of long bones of right lower limb
C40.22 Malignant neoplasm of long bones of left lower limb
C40.31 Malignant neoplasm of short bones of right lower limb
C40.32 Malignant neoplasm of short bones of left lower limb
C40.81 Malignant neoplasm of overlapping sites of bone and articular cartilage of right limb
C40.82 Malignant neoplasm of overlapping sites of bone and articular cartilage of left limb
C40.91 Malignant neoplasm of unspecified bones and articular cartilage of right limb
C40.92 Malignant neoplasm of unspecified bones and articular cartilage of left limb
C41.0 Malignant neoplasm of bones of skull and face
C41.1 Malignant neoplasm of mandible
C41.2 Malignant neoplasm of vertebral column
C41.3 Malignant neoplasm of ribs, sternum and clavicle
C41.4 Malignant neoplasm of pelvic bones, sacrum and coccyx
C43.0 Malignant melanoma of lip
C43.111 Malignant melanoma of right upper eyelid, including canthus
C43.112 Malignant melanoma of right lower eyelid, including canthus
C43.121 Malignant melanoma of left upper eyelid, including canthus
C43.122 Malignant melanoma of left lower eyelid, including canthus
C43.21 Malignant melanoma of right ear and external auricular canal
C43.22 Malignant melanoma of left ear and external auricular canal
C43.31 Malignant melanoma of nose
C43.39 Malignant melanoma of other parts of face
C43.4 Malignant melanoma of scalp and neck
C43.51 Malignant melanoma of anal skin
C43.52 Malignant melanoma of skin of breast
C43.59 Malignant melanoma of other part of trunk
C43.61 Malignant melanoma of right upper limb, including shoulder
C43.62 Malignant melanoma of left upper limb, including shoulder
C43.71 Malignant melanoma of right lower limb, including hip
C43.72 Malignant melanoma of left lower limb, including hip
C43.8 Malignant melanoma of overlapping sites of skin
C47.0 Malignant neoplasm of peripheral nerves of head, face and neck
C47.11  Malignant neoplasm of peripheral nerves of right upper limb, including shoulder
C47.12  Malignant neoplasm of peripheral nerves of left upper limb, including shoulder
C47.21  Malignant neoplasm of peripheral nerves of right lower limb, including hip
C47.22  Malignant neoplasm of peripheral nerves of left lower limb, including hip
C47.3   Malignant neoplasm of peripheral nerves of thorax
C47.4   Malignant neoplasm of peripheral nerves of abdomen
C47.5   Malignant neoplasm of peripheral nerves of pelvis
C47.8   Malignant neoplasm of overlapping sites of peripheral nerves and autonomic nervous system
C47.9   Malignant neoplasm of peripheral nerves and autonomic nervous system, unspecified
C49.0   Malignant neoplasm of connective and soft tissue of head, face and neck
C49.11  Malignant neoplasm of connective and soft tissue of right upper limb, including shoulder
C49.12  Malignant neoplasm of connective and soft tissue of left upper limb, including shoulder
C49.21  Malignant neoplasm of connective and soft tissue of right lower limb, including hip
C49.22  Malignant neoplasm of connective and soft tissue of left lower limb, including hip
C49.3   Malignant neoplasm of connective and soft tissue of thorax
C49.4   Malignant neoplasm of connective and soft tissue of abdomen
C49.5   Malignant neoplasm of connective and soft tissue of pelvis
C49.8   Malignant neoplasm of overlapping sites of connective and soft tissue
C49A1  Gastrointestinal stromal tumor of esophagus
C49A2  Gastrointestinal stromal tumor of stomach
C49A3  Gastrointestinal stromal tumor of small intestine
C49A4  Gastrointestinal stromal tumor of large intestine
C49A5  Gastrointestinal stromal tumor of rectum
C49A9  Gastrointestinal stromal tumor of other sites
C4A.0  Merkel cell carcinoma of lip
C4A.111 Merkel cell carcinoma of right upper eyelid, inc canthus
C4A.112 Merkel cell carcinoma of right lower eyelid, inc canthus
C4A.121 Merkel cell carcinoma of left upper eyelid, inc canthus
C4A.122 Merkel cell carcinoma of left lower eyelid, inc canthus
C4A.21  Merkel cell carcinoma of right ear and external auricular canal
C4A.22  Merkel cell carcinoma of left ear and external auricular canal
C4A.31  Merkel cell carcinoma of nose
C4A.39  Merkel cell carcinoma of other parts of face
C4A.4   Merkel cell carcinoma of scalp and neck
C4A.51  Merkel cell carcinoma of anal skin
C4A.52  Merkel cell carcinoma of skin of breast
C4A.59  Merkel cell carcinoma of other part of trunk
C4A.61  Merkel cell carcinoma of right upper limb, including shoulder
C4A.62  Merkel cell carcinoma of left upper limb, including shoulder
C4A.71  Merkel cell carcinoma of right lower limb, including hip
C4A.72  Merkel cell carcinoma of left lower limb, including hip
C4A.8   Merkel cell carcinoma of overlapping sites
C50.011 Malignant neoplasm of nipple and areola, right female breast
C50.012 Malignant neoplasm of nipple and areola, left female breast
C50.021 Malignant neoplasm of nipple and areola, right male breast
C50.022 Malignant neoplasm of nipple and areola, left male breast
C50.111 Malignant neoplasm of central portion of right female breast
C50.112 Malignant neoplasm of central portion of left female breast
C50.121 Malignant neoplasm of central portion of right male breast
C50.122 Malignant neoplasm of central portion of left male breast
C50.211 Malignant neoplasm of upper-inner quadrant of right female breast
C50.212 Malignant neoplasm of upper-inner quadrant of left female breast
C50.221 Malignant neoplasm of upper-inner quadrant of right male breast

Contains Public Information
C50.222 Malignant neoplasm of upper-inner quadrant of left male breast
C50.311 Malignant neoplasm of lower-inner quadrant of right female breast
C50.312 Malignant neoplasm of lower-inner quadrant of left female breast
C50.321 Malignant neoplasm of lower-inner quadrant of right male breast
C50.322 Malignant neoplasm of lower-inner quadrant of left male breast
C50.411 Malignant neoplasm of upper-outer quadrant of right female breast
C50.412 Malignant neoplasm of upper-outer quadrant of left female breast
C50.421 Malignant neoplasm of upper-outer quadrant of right male breast
C50.422 Malignant neoplasm of upper-outer quadrant of left male breast
C50.511 Malignant neoplasm of lower-outer quadrant of right female breast
C50.512 Malignant neoplasm of lower-outer quadrant of left female breast
C50.521 Malignant neoplasm of lower-outer quadrant of right male breast
C50.522 Malignant neoplasm of lower-outer quadrant of left male breast
C50.611 Malignant neoplasm of axillary tail of right female breast
C50.612 Malignant neoplasm of axillary tail of left female breast
C50.621 Malignant neoplasm of axillary tail of right male breast
C50.622 Malignant neoplasm of axillary tail of left male breast
C50.811 Malignant neoplasm of overlapping sites of right female breast
C50.812 Malignant neoplasm of overlapping sites of left female breast
C50.821 Malignant neoplasm of overlapping sites of right male breast
C50.822 Malignant neoplasm of overlapping sites of left male breast
C51.8 Malignant neoplasm of overlapping sites of vulva
C53.0 Malignant neoplasm of endocervix
C53.1 Malignant neoplasm of exocervix
C53.8 Malignant neoplasm of overlapping sites of cervix uteri
C56.1 Malignant neoplasm of right ovary
C56.2 Malignant neoplasm of left ovary
C57.4 Malignant neoplasm of uterine adnexa, unspecified
C57.8 Malignant neoplasm of overlapping sites of female genital organs
C62.01 Malignant neoplasm of undescended right testis
C62.02 Malignant neoplasm of undescended left testis
C62.11 Malignant neoplasm of descended right testis
C62.12 Malignant neoplasm of descended left testis
C62.91 Malignant neoplasm of right testis, unspecified whether descended or undescended
C62.92 Malignant neoplasm of left testis, unspecified whether descended or undescended
C64.1 Malignant neoplasm of right kidney, except renal pelvis
C64.2 Malignant neoplasm of left kidney, except renal pelvis
C65.1 Malignant neoplasm of right renal pelvis
C65.2 Malignant neoplasm of left renal pelvis
C70.0 Malignant neoplasm of cerebral meninges
C70.1 Malignant neoplasm of spinal meninges
C71.0 Malignant neoplasm of cerebrum, except lobes and ventricles
C71.1 Malignant neoplasm of frontal lobe
C71.2 Malignant neoplasm of temporal lobe
C71.3 Malignant neoplasm of parietal lobe
C71.4 Malignant neoplasm of occipital lobe
C71.5 Malignant neoplasm of cerebral ventricle
C71.6 Malignant neoplasm of cerebellum
C71.7 Malignant neoplasm of brain stem
C71.8 Malignant neoplasm of overlapping sites of brain
C71.9 Malignant neoplasm of brain, unspecified
C72.0 Malignant neoplasm of spinal cord
C72.1 Malignant neoplasm of cauda equina
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<td>Mixed cellularity Hodgkin lymphoma, lymph nodes of axilla and upper limb</td>
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C81.79  Other Hodgkin lymphoma, extranodal and solid organ sites
C81.91  Hodgkin lymphoma, unspecified, lymph nodes of head, face, and neck
C81.92  Hodgkin lymphoma, unspecified, intrathoracic lymph nodes
C81.93  Hodgkin lymphoma, unspecified, intra-abdominal lymph nodes
C81.94  Hodgkin lymphoma, unspecified, lymph nodes of axilla and upper limb
C81.95  Hodgkin lymphoma, unspecified, lymph nodes of inguinal region and lower limb
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C81.97  Hodgkin lymphoma, unspecified, spleen
C81.98  Hodgkin lymphoma, unspecified, lymph nodes of multiple sites
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C82.02  Follicular lymphoma grade I, intrathoracic lymph nodes
C82.03  Follicular lymphoma grade I, intra-abdominal lymph nodes
C82.04  Follicular lymphoma grade I, lymph nodes of axilla and upper limb
C82.05  Follicular lymphoma grade I, lymph nodes of inguinal region and lower limb
C82.06  Follicular lymphoma grade I, intrapelvic lymph nodes
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C82.11  Follicular lymphoma grade II, lymph nodes of head, face, and neck
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C82.41  Follicular lymphoma grade IIIb, lymph nodes of head, face, and neck
C82.42  Follicular lymphoma grade IIIb, intrathoracic lymph nodes
C82.43  Follicular lymphoma grade IIIb, intra-abdominal lymph nodes
C82.44  Follicular lymphoma grade IIIb, lymph nodes of axilla and upper limb
C82.45  Follicular lymphoma grade IIIb, lymph nodes of inguinal region and lower limb
C82.46  Follicular lymphoma grade IIIb, intrapelvic lymph nodes
C82.47  Follicular lymphoma grade IIIb, spleen
C82.48  Follicular lymphoma grade IIIb, lymph nodes of multiple sites  
C82.49  Follicular lymphoma grade IIIb, extranodal and solid organ sites  
C82.51  Diffuse follicle center lymphoma, lymph nodes of head, face, and neck  
C82.52  Diffuse follicle center lymphoma, intrathoracic lymph nodes  
C82.53  Diffuse follicle center lymphoma, intra-abdominal lymph nodes  
C82.54  Diffuse follicle center lymphoma, lymph nodes of axilla and upper limb  
C82.55  Diffuse follicle center lymphoma, lymph nodes of inguinal region and lower limb  
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C82.64  Cutaneous follicle center lymphoma, lymph nodes of axilla and upper limb  
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C82.66  Cutaneous follicle center lymphoma, intrapelvic lymph nodes  
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C82.68  Cutaneous follicle center lymphoma, lymph nodes of multiple sites  
C82.69  Cutaneous follicle center lymphoma, extranodal and solid organ sites  
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C82.90  Follicular lymphoma, unspecified, unspecified site  
C82.91  Follicular lymphoma, unspecified, lymph nodes of head, face, and neck  
C82.95  Follicular lymphoma, unspecified, lymph nodes of inguinal region and lower limb  
C82.99  Follicular lymphoma, unspecified, extranodal and solid organ sites  
C83.01  Small cell B-cell lymphoma, lymph nodes of head, face, and neck  
C83.02  Small cell B-cell lymphoma, intrathoracic lymph nodes  
C83.03  Small cell B-cell lymphoma, intra-abdominal lymph nodes  
C83.04  Small cell B-cell lymphoma, lymph nodes of axilla and upper limb  
C83.05  Small cell B-cell lymphoma, lymph nodes of inguinal region and lower limb  
C83.06  Small cell B-cell lymphoma, intrapelvic lymph nodes  
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C83.08  Small cell B-cell lymphoma, lymph nodes of multiple sites  
C83.09  Small cell B-cell lymphoma, extranodal and solid organ sites  
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C83.12  Mantle cell lymphoma, intrathoracic lymph nodes  
C83.13  Mantle cell lymphoma, intra-abdominal lymph nodes  
C83.14  Mantle cell lymphoma, lymph nodes of axilla and upper limb  
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C83.16  Mantle cell lymphoma, intrapelvic lymph nodes  
C83.17  Mantle cell lymphoma, spleen  
C83.18  Mantle cell lymphoma, lymph nodes of multiple sites  
C83.19  Mantle cell lymphoma, extranodal and solid organ sites  
C83.31  Diffuse large B-cell lymphoma, lymph nodes of head, face, and neck  
C83.32  Diffuse large B-cell lymphoma, intrathoracic lymph nodes  
C83.33  Diffuse large B-cell lymphoma, intra-abdominal lymph nodes  
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C83.36  Diffuse large B-cell lymphoma, intrapelvic lymph nodes  
C83.37  Diffuse large B-cell lymphoma, spleen  
C83.38  Diffuse large B-cell lymphoma, lymph nodes of multiple sites
C83.39 Diffuse large B-cell lymphoma, extranodal and solid organ sites
C83.51 Lymphoblastic (diffuse) lymphoma, lymph nodes of head, face, and neck
C83.52 Lymphoblastic (diffuse) lymphoma, intrathoracic lymph nodes
C83.53 Lymphoblastic (diffuse) lymphoma, intra-abdominal lymph nodes
C83.54 Lymphoblastic (diffuse) lymphoma, lymph nodes of axilla and upper limb
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C83.57 Lymphoblastic (diffuse) lymphoma, spleen
C83.58 Lymphoblastic (diffuse) lymphoma, lymph nodes of multiple sites
C83.59 Lymphoblastic (diffuse) lymphoma, extranodal and solid organ sites
C83.71 Burkitt lymphoma, lymph nodes of head, face, and neck
C83.72 Burkitt lymphoma, intrathoracic lymph nodes
C83.73 Burkitt lymphoma, intra-abdominal lymph nodes
C83.74 Burkitt lymphoma, lymph nodes of axilla and upper limb
C83.75 Burkitt lymphoma, lymph nodes of inguinal region and lower limb
C83.76 Burkitt lymphoma, intrapelvic lymph nodes
C83.77 Burkitt lymphoma, spleen
C83.78 Burkitt lymphoma, lymph nodes of multiple sites
C83.79 Burkitt lymphoma, extranodal and solid organ sites
C83.81 Other non-follicular lymphoma, lymph nodes of head, face, and neck
C83.82 Other non-follicular lymphoma, intrathoracic lymph nodes
C83.83 Other non-follicular lymphoma, intra-abdominal lymph nodes
C83.84 Other non-follicular lymphoma, lymph nodes of axilla and upper limb
C83.85 Other non-follicular lymphoma, lymph nodes of inguinal region and lower limb
C83.86 Other non-follicular lymphoma, intrapelvic lymph nodes
C83.87 Other non-follicular lymphoma, spleen
C83.88 Other non-follicular lymphoma, lymph nodes of multiple sites
C83.89 Other non-follicular lymphoma, extranodal and solid organ sites
C83.91 Non-follicular (diffuse) lymphoma, unspecified, lymph nodes of head, face, and neck
C83.92 Non-follicular (diffuse) lymphoma, unspecified, intrathoracic lymph nodes
C83.93 Non-follicular (diffuse) lymphoma, unspecified, intra-abdominal lymph nodes
C83.94 Non-follicular (diffuse) lymphoma, unspecified, lymph nodes of axilla and upper limb
C83.95 Non-follicular (diffuse) lymphoma, unspecified, lymph nodes of inguinal region and lower limb
C83.96 Non-follicular (diffuse) lymphoma, unspecified, intrapelvic lymph nodes
C83.97 Non-follicular (diffuse) lymphoma, unspecified, spleen
C83.98 Non-follicular (diffuse) lymphoma, unspecified, lymph nodes of multiple sites
C83.99 Non-follicular (diffuse) lymphoma, unspecified, extranodal and solid organ sites
C84.01 Mycosis fungoides, lymph nodes of head, face, and neck
C84.02 Mycosis fungoides, intrathoracic lymph nodes
C84.03 Mycosis fungoides, intra-abdominal lymph nodes
C84.04 Mycosis fungoides, lymph nodes of axilla and upper limb
C84.05 Mycosis fungoides, lymph nodes of inguinal region and lower limb
C84.06 Mycosis fungoides, intrapelvic lymph nodes
C84.07 Mycosis fungoides, spleen
C84.08 Mycosis fungoides, lymph nodes of multiple sites
C84.09 Mycosis fungoides, extranodal and solid organ sites
C84.11 Sezary disease, lymph nodes of head, face, and neck
C84.12 Sezary disease, intrathoracic lymph nodes
C84.13 Sezary disease, intra-abdominal lymph nodes
C84.14 Sezary disease, lymph nodes of axilla and upper limb
C84.15 Sezary disease, lymph nodes of inguinal region and lower limb
C84.16 Sezary disease, intrapelvic lymph nodes
C84.17 Sezary disease, spleen
C84.18 Sezary disease, lymph nodes of multiple sites
C84.19 Sezary disease, extranodal and solid organ sites
C84.41 Peripheral T-cell lymphoma, not classified, lymph nodes of head, face, and neck
C84.42 Peripheral T-cell lymphoma, not classified, intrathoracic lymph nodes
C84.43 Peripheral T-cell lymphoma, not classified, intra-abdominal lymph nodes
C84.44 Peripheral T-cell lymphoma, not classified, lymph nodes of axilla and upper limb
C84.45 Peripheral T-cell lymphoma, not classified, lymph nodes of inguinal region and lower limb
C84.46 Peripheral T-cell lymphoma, not classified, intrapelvic lymph nodes
C84.47 Peripheral T-cell lymphoma, not classified, spleen
C84.48 Peripheral T-cell lymphoma, not classified, lymph nodes of multiple sites
C84.49 Peripheral T-cell lymphoma, not classified, extranodal and solid organ sites
C84.61 Anaplastic large cell lymphoma, ALK-positive, lymph nodes of head, face, and neck
C84.62 Anaplastic large cell lymphoma, ALK-positive, intrathoracic lymph nodes
C84.63 Anaplastic large cell lymphoma, ALK-positive, intra-abdominal lymph nodes
C84.64 Anaplastic large cell lymphoma, ALK-positive, lymph nodes of axilla and upper limb
C84.65 Anaplastic large cell lymphoma, ALK-positive, lymph nodes of inguinal region and lower limb
C84.66 Anaplastic large cell lymphoma, ALK-positive, intrapelvic lymph nodes
C84.67 Anaplastic large cell lymphoma, ALK-positive, spleen
C84.68 Anaplastic large cell lymphoma, ALK-positive, lymph nodes of multiple sites
C84.69 Anaplastic large cell lymphoma, ALK-positive, extranodal and solid organ sites
C84.71 Anaplastic large cell lymphoma, ALK-negative, lymph nodes of head, face, and neck
C84.72 Anaplastic large cell lymphoma, ALK-negative, intrathoracic lymph nodes
C84.73 Anaplastic large cell lymphoma, ALK-negative, intra-abdominal lymph nodes
C84.74 Anaplastic large cell lymphoma, ALK-negative, lymph nodes of axilla and upper limb
C84.75 Anaplastic large cell lymphoma, ALK-negative, lymph nodes of inguinal region and lower limb
C84.76 Anaplastic large cell lymphoma, ALK-negative, intrapelvic lymph nodes
C84.77 Anaplastic large cell lymphoma, ALK-negative, spleen
C84.78 Anaplastic large cell lymphoma, ALK-negative, lymph nodes of multiple sites
C84.79 Anaplastic large cell lymphoma, ALK-negative, extranodal and solid organ sites
C84.90 Mature T/NK-cell lymphomas, unspecified, unspecified site
C84.91 Mature T/NK-cell lymphomas, unspecified, lymph nodes of head, face, and neck
C84.92 Mature T/NK-cell lymphomas, unspecified, intra-abdominal lymph nodes
C84.93 Mature T/NK-cell lymphomas, unspecified, lymph nodes of axilla and upper limb
C84.94 Mature T/NK-cell lymphomas, unspecified, lymph nodes of inguinal region and lower limb
C84.95 Mature T/NK-cell lymphomas, unspecified, intrapelvic lymph nodes
C84.96 Mature T/NK-cell lymphomas, unspecified, spleen
C84.97 Mature T/NK-cell lymphomas, unspecified, lymph nodes of multiple sites
C84.98 Mature T/NK-cell lymphomas, unspecified, extranodal and solid organ sites
C84.99 Mature T/NK-cell lymphomas, unspecified, extranodal and solid organ sites
C84.A1 Cutaneous T-cell lymphoma, unspecified lymph nodes of head, face, and neck
C84.A2 Cutaneous T-cell lymphoma, unspecified, intra-abdominal lymph nodes
C84.A3 Cutaneous T-cell lymphoma, unspecified, lymph nodes of axilla and upper limb
C84.A4 Cutaneous T-cell lymphoma, unspecified, lymph nodes of inguinal region and lower limb
C84.A5 Cutaneous T-cell lymphoma, unspecified, intrapelvic lymph nodes
C84.A6 Cutaneous T-cell lymphoma, unspecified, spleen
C84.A7 Cutaneous T-cell lymphoma, unspecified, lymph nodes of multiple sites
C84.A8 Cutaneous T-cell lymphoma, unspecified, extranodal and solid organ sites
C84.A9 Cutaneous T-cell lymphoma, unspecified, extranodal and solid organ sites
C84.Z1 Other mature T/NK-cell lymphomas, lymph nodes of head, face, and neck
C84.Z2 Other mature T/NK-cell lymphomas, intrathoracic lymph nodes
C84.Z3 Other mature T/NK-cell lymphomas, intra-abdominal lymph nodes
C84.Z4 Other mature T/NK-cell lymphomas, lymph nodes of axilla and upper limb
C84.Z5 Other mature T/NK-cell lymphomas, lymph nodes of inguinal region and lower limb
C84.Z6 Other mature T/NK-cell lymphomas, intrapelvic lymph nodes
C84.Z7 Other mature T/NK-cell lymphomas, spleen
C84.Z8 Other mature T/NK-cell lymphomas, lymph nodes of multiple sites
C84.29 Other mature T/NK-cell lymphomas, extranodal and solid organ sites
C85.11 Unspecified B-cell lymphoma, lymph nodes of head, face, and neck
C85.13 Unspecified B-cell lymphoma, intra-abdominal lymph nodes
C85.14 Unspecified B-cell lymphoma, lymph nodes of axilla and upper limb
C85.16 Unspecified B-cell lymphoma, intrapelvic lymph nodes
C85.17 Unspecified B-cell lymphoma, spleen
C85.18 Unspecified B-cell lymphoma, lymph nodes of multiple sites
C85.19 Unspecified B-cell lymphoma, extranodal and solid organ sites
C85.21 Mediastinal (thymic) large B-cell lymphoma, lymph nodes of head, face, and neck
C85.22 Mediastinal (thymic) large B-cell lymphoma, intrathoracic lymph nodes
C85.23 Mediastinal (thymic) large B-cell lymphoma, intra-abdominal lymph nodes
C85.24 Mediastinal (thymic) large B-cell lymphoma, lymph nodes of axilla and upper limb
C85.25 Mediastinal (thymic) large B-cell lymphoma, lymph nodes of inguinal region and lower limb
C85.26 Mediastinal (thymic) large B-cell lymphoma, intrapelvic lymph nodes
C85.27 Mediastinal (thymic) large B-cell lymphoma, spleen
C85.28 Mediastinal (thymic) large B-cell lymphoma, lymph nodes of multiple sites
C85.29 Mediastinal (thymic) large B-cell lymphoma, extranodal and solid organ sites
C85.81 Other specified types of non-Hodgkin lymphoma, lymph nodes of head, face, and neck
C85.82 Other specified types of non-Hodgkin lymphoma, intrathoracic lymph nodes
C85.83 Other specified types of non-Hodgkin lymphoma, intra-abdominal lymph nodes
C85.84 Other specified types of non-Hodgkin lymphoma, lymph nodes of axilla and upper limb
C85.85 Other specified types of non-Hodgkin lymphoma, lymph nodes of inguinal region and lower limb
C85.86 Other specified types of non-Hodgkin lymphoma, intrapelvic lymph nodes
C85.87 Other specified types of non-Hodgkin lymphoma, spleen
C85.88 Other specified types of non-Hodgkin lymphoma, lymph nodes of multiple sites
C85.89 Other specified types of non-Hodgkin lymphoma, extranodal and solid organ sites
C85.91 Non-Hodgkin lymphoma, unspecified, lymph nodes of head, face, and neck
C85.92 Non-Hodgkin lymphoma, unspecified, intrathoracic lymph nodes
C85.93 Non-Hodgkin lymphoma, unspecified, intra-abdominal lymph nodes
C85.94 Non-Hodgkin lymphoma, unspecified, lymph nodes of axilla and upper limb
C85.95 Non-Hodgkin lymphoma, unspecified, lymph nodes of inguinal region and lower limb
C85.96 Non-Hodgkin lymphoma, unspecified, intrapelvic lymph nodes
C85.97 Non-Hodgkin lymphoma, unspecified, spleen
C85.98 Non-Hodgkin lymphoma, unspecified, lymph nodes of multiple sites
C85.99 Non-Hodgkin lymphoma, unspecified, extranodal and solid organ sites
C86.0 Extranodal NK/T-cell lymphoma, nasal type
C86.1 Hepatosplenic T-cell lymphoma
C86.2 Enteropathy-type (intestinal) T-cell lymphoma
C86.3 Subcutaneous panniculitis-like T-cell lymphoma
C86.4 Blastic NK-cell lymphoma
C86.5 Angioimmunoblastic T-cell lymphoma
C86.6 Primary cutaneous CD30-positive T-cell proliferations
C88.2 Heavy chain disease
C88.3 Immunoproliferative small intestinal disease
C88.4 Extranodal marginal zone B-cell lymphoma of mucosa-associated lymphoid tissue [MALT-lymphoma]
C88.8 Other malignant immunoproliferative diseases
C88.9 Malignant immunoproliferative disease, unspecified
C90.00 Multiple myeloma not having achieved remission
C90.01 Multiple myeloma in remission
C90.02  Multiple myeloma in relapse
C90.20  Extramedullary plasmacytoma not having achieved remission
C90.21  Extramedullary plasmacytoma in remission
C90.22  Extramedullary plasmacytoma in relapse
C90.30  Solitary plasmacytoma not having achieved remission
C90.31  Solitary plasmacytoma in remission
C90.32  Solitary plasmacytoma in relapse
C91.40  Hairy cell leukemia not having achieved remission
C91.41  Hairy cell leukemia, in remission
C91.42  Hairy cell leukemia, in relapse
C96.0   Multifocal and multisystemic (disseminated) Langerhans-cell histiocytosis
C96.20  Malignant mast cell neoplasm, unspecified
C96.21  Aggressive systemic mastocytosis
C96.22  Mast cell sarcoma
C96.29  Other malignant mast cell neoplasm
C96.4   Sarcoma of dendritic cells (accessory cells)
C96.9   Malignant neoplasm of lymphoid, hematopoietic and related tissue, unspecified
C96A    Histiocytic sarcoma
C96.Z   Other specified malignant neoplasms of lymphoid, hematopoietic and related tissue
D00.1   Carcinoma in situ of esophagus
D01.0   Carcinoma in situ of colon
D01.1   Carcinoma in situ of rectosigmoid junction
D01.2   Carcinoma in situ of rectum
D01.3   Carcinoma in situ of anus and anal canal
D01.7   Carcinoma in situ of other specified digestive organs
D02.21  Carcinoma in situ of right bronchus and lung
D02.22  Carcinoma in situ of left bronchus and lung
D03.0   Melanoma in situ of lip
D03.111 Melanoma in situ of right upper eyelid, including canthus
D03.112 Melanoma in situ of right lower eyelid, including canthus
D03.121 Melanoma in situ of left upper eyelid, including canthus
D03.122 Melanoma in situ of left lower eyelid, including canthus
D03.21  Melanoma in situ of right ear and external auricular canal
D03.22  Melanoma in situ of left ear and external auricular canal
D03.39  Melanoma in situ of other parts of face
D03.4   Melanoma in situ of scalp and neck
D03.51  Melanoma in situ of anal skin
D03.52  Melanoma in situ of breast (skin) (soft tissue)
D03.59  Melanoma in situ of other part of trunk
D03.61  Melanoma in situ of right upper limb, including shoulder
D03.62  Melanoma in situ of left upper limb, including shoulder
D03.71  Melanoma in situ of right lower limb, including hip
D03.72  Melanoma in situ of left lower limb, including hip
D03.8   Melanoma in situ of other sites
D06.0   Carcinoma in situ of endocervix
D06.1   Carcinoma in situ of exocervix
D06.7   Carcinoma in situ of other parts of cervix
D07.39  Carcinoma in situ of other female genital organs
D09.3   Carcinoma in situ of thyroid and other endocrine glands
D09.8   Carcinoma in situ of other specified sites
D12.0   Benign neoplasm of cecum
D12.1   Benign neoplasm of appendix
D12.2   Benign neoplasm of ascending colon
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<tr>
<th>Code</th>
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<tbody>
<tr>
<td>D12.3</td>
<td>Benign neoplasm of transverse colon</td>
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<td>Benign neoplasm of descending colon</td>
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<td>D12.5</td>
<td>Benign neoplasm of sigmoid colon</td>
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<td>D12.7</td>
<td>Benign neoplasm of rectosigmoid junction</td>
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<tr>
<td>D12.8</td>
<td>Benign neoplasm of rectum</td>
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<tr>
<td>D12.9</td>
<td>Benign neoplasm of anus and anal canal</td>
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<td>Benign neoplasm of esophagus</td>
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<tr>
<td>D14.31</td>
<td>Benign neoplasm of right bronchus and lung</td>
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<tr>
<td>D14.32</td>
<td>Benign neoplasm of left bronchus and lung</td>
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<tr>
<td>D35.01</td>
<td>Benign neoplasm of right adrenal gland</td>
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<td>D35.02</td>
<td>Benign neoplasm of left adrenal gland</td>
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<tr>
<td>D37.1</td>
<td>Neoplasm of uncertain behavior of stomach</td>
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<tr>
<td>D37.2</td>
<td>Neoplasm of uncertain behavior of small intestine</td>
</tr>
<tr>
<td>D37.3</td>
<td>Neoplasm of uncertain behavior of appendix</td>
</tr>
<tr>
<td>D37.4</td>
<td>Neoplasm of uncertain behavior of colon</td>
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<tr>
<td>D37.5</td>
<td>Neoplasm of uncertain behavior of rectum</td>
</tr>
<tr>
<td>D37.8</td>
<td>Neoplasm of uncertain behavior of other specified digestive organs</td>
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<td>D37.9</td>
<td>Neoplasm of uncertain behavior of digestive organ, unspecified</td>
</tr>
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<td>D38.1</td>
<td>Neoplasm of uncertain behavior of trachea, bronchus and lung</td>
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<td>D3A.010</td>
<td>Benign carcinoid tumor of the duodenum</td>
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<td>Benign carcinoid tumor of the jejunum</td>
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<td>Benign carcinoid tumor of the ileum</td>
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<td>Benign carcinoid tumor of the small intestine, unspecified portion</td>
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<td>D3A.020</td>
<td>Benign carcinoid tumor of the appendix</td>
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<tr>
<td>D3A.021</td>
<td>Benign carcinoid tumor of the cecum</td>
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<td>D3A.022</td>
<td>Benign carcinoid tumor of the ascending colon</td>
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<td>Benign carcinoid tumor of the transverse colon</td>
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<td>D3A.024</td>
<td>Benign carcinoid tumor of the descending colon</td>
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<td>D3A.025</td>
<td>Benign carcinoid tumor of the sigmoid colon</td>
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<td>D3A.026</td>
<td>Benign carcinoid tumor of the rectum</td>
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<td>D3A.029</td>
<td>Benign carcinoid tumor of the large intestine, unspecified portion</td>
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<td>D3A.090</td>
<td>Benign carcinoid tumor of the bronchus and lung</td>
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<tr>
<td>D3A.091</td>
<td>Benign carcinoid tumor of the thymus</td>
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<tr>
<td>D3A.092</td>
<td>Benign carcinoid tumor of the stomach</td>
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<td>D3A.093</td>
<td>Benign carcinoid tumor of the kidney</td>
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<td>Benign carcinoid tumor of the foregut, unspecified</td>
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<td>Benign carcinoid tumor of the midgut, unspecified</td>
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<td>Benign carcinoid tumor of the hindgut, unspecified</td>
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<td>Benign carcinoid tumors of other sites</td>
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<td>Other benign neuroendocrine tumors</td>
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<td>Neoplasm of uncertain behavior of spinal cord</td>
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<td>D44.6</td>
<td>Neoplasm of uncertain behavior of carotid body</td>
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<td>D44.7</td>
<td>Neoplasm of uncertain behavior of aortic body and other paraganglia</td>
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<td>D47.Z9</td>
<td>Other specified neoplasms of uncertain behavior of lymphoid, hematopoietic and related tissue</td>
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<td>D48.1</td>
<td>Neoplasm of uncertain behavior of connective and other soft tissue</td>
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<td>D48.2</td>
<td>Neoplasm of uncertain behavior of peripheral nerves and autonomic nervous system</td>
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<tr>
<td>D49.0</td>
<td>Neoplasm of unspecified behavior of digestive system</td>
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<td>D49.1</td>
<td>Neoplasm of unspecified behavior of respiratory system</td>
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<td>Neoplasm of unspecified behavior of brain</td>
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<tr>
<td>J98.4</td>
<td>Other disorders of lung</td>
</tr>
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</table>
K63.5  Polyp of colon
R22.0  Localized swelling, mass and lump, head
R22.1  Localized swelling, mass and lump, neck
R59.0  Localized enlarged lymph nodes
R59.1  Generalized enlarged lymph nodes
R59.9  Enlarged lymph nodes, unspecified
R76.0  Raised antibody titer
R76.8  Other specified abnormal immunological findings in serum
R76.9  Abnormal immunological finding in serum, unspecified
R90.0  Intracranial space-occupying lesion found on diagnostic imaging of central nervous system
Z85.01  Personal history of malignant neoplasm of esophagus
Z85.038  Personal history of other malignant neoplasm of large intestine
Z85.048  Personal history of other malignant neoplasm of rectum, rectosigmoid junction, and anus
Z85.118  Personal history of other malignant neoplasm of bronchus and lung
Z85.12  Personal history of malignant neoplasm of trachea
Z85.20  Personal history of malignant neoplasm of unspecified respiratory organ
Z85.21  Personal history of malignant neoplasm of larynx
Z85.22  Personal history of malignant neoplasm of nasal cavities, middle ear, and accessory sinuses
Z85.238  Personal history of other malignant neoplasm of thymus
Z85.29  Personal history of malignant neoplasm of other respiratory and intrathoracic organs
Z85.43  Personal history of malignant neoplasm of ovary
Z85.71  Personal history of Hodgkin lymphoma
Z85.72  Personal history of non-Hodgkin lymphomas
Z85.79  Personal history of other malignant neoplasms of lymphoid, hematopoietic and related tissues
Z85.810  Personal history of malignant neoplasm of tongue
Z85.818  Personal history of malignant neoplasm of other sites of lip, oral cavity, and pharynx
Z85.819  Personal history of malignant neoplasm of unspecified site of lip, oral cavity, and pharynx
Z85.820  Personal history of malignant melanoma of skin
Z85.850  Personal history of malignant neoplasm of thyroid

**REVISED**

**10-30-2013**  Oncologic Applications was originally part of the Positron Emission Tomography (PET) medical policy. Oncologic Applications has been pulled out and placed into a separate medical policy, Positron Emission Tomography (PET): Oncologic Applications. The medical policy language was unchanged.

- Updated Description section.
- Updated Rationale section.

In Coding section:
- Added ICD-10 Diagnosis codes *(Effective October 1, 2014)*

Updated Reference section.

**10-28-2014**  In Coding section:
- Removed ICD-9 Diagnosis code 793.1 (expired 09/30/2011)
- Added ICD-9 Diagnosis code 793.19

**10-22-2015**  Description section updated

In Policy section:
- Revised to current policy language by location of cancer from the following policy language by diagnosing, staging, re-staging:
  "I. PET scan with or without PET/CT fusion is considered medically necessary for the following tumors when results are expected to influence treatment decisions and standard imaging (e.g., CT, MRI or ultrasound) is inconclusive or not indicated:
A. Diagnosing or Staging
B. Re-Staging
C. Other oncologic indications may be considered medically necessary on a case by case basis when results are expected to influence treatment decisions.
D. Experimental / experimental / investigational oncologic application include, but not limited to:
   1. Initial therapy for ovarian cancer or testicular cancer; or
   2. Subsequent therapy for small cell lung cancer (SCLC) or pancreatic cancer; or
   3. Diagnosis and management of prostate cancer; or
   4. To determine early response to treatments (PET scans done during a course of chemotherapy of reduction therapy).
E. Surveillance
   Intermittent surveillance scanning for Ewing Sarcoma is considered medically necessary.

Rationale section updated

In Coding section:
- Added CPT and HCPCS Codes: 78608, 78609, G0252
- Updated Coding notations

References updated

- Correction to 10-22-2015 Revision section above.
- In Coding section changed "G0525" to "G0252" to read, "Added CPT and HCPCS Codes: 78608, 78609, G0252"


In Coding Section:
- Removed ICD-10 Codes: C34.10, C47.10, C47.20, C49.10, C49.20, C50.911, C50.912, C50.921, C50.922, C74.91, C74.92, C84.70
- Added ICD-10 Codes: C16.5, C16.6, C47.9, C4A.0, C4A.11, C4A.12, C4A.21, C4A.22, C4A.31, C4A.39, C4A.4, C4A.51, C4A.52, C4A.59, C4A.61, C4A.62, C4A.71, C4A.72, C4A.8, C7A.010, C7A.011, C7A.012, C7A.019, C7A.020, C7A.021, C7A.022, C7A.023, C7A.024, C7A.025, C7A.026, C7A.029, C7A.090, C7A.091, C7A.092, C7A.093, C7A.094, C7A.095, C7A.096, C7A.098, C7A.1, C7A.8, C80.0, C80.1, C81.01, C81.02, C81.03, C81.04, C81.05, C81.06, C81.07, C81.08, C81.09, C81.11, C81.12, C81.13, C81.14, C81.15, C81.16, C81.17, C81.18, C81.19, C81.21, C81.22, C81.23, C81.24, C81.25, C81.26, C81.27, C81.28, C81.29, C81.31, C81.32, C81.33, C81.34, C81.35, C81.36, C81.37, C81.38, C81.39, C81.41, C81.42, C81.43, C81.44, C81.45, C81.46, C81.47, C81.48, C81.49, C81.71, C81.72, C81.73, C81.74, C81.75, C81.76, C81.77, C81.78, C81.79, C81.91,
**REVISIONS**

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- ICD-10 Codes Revised Effective 10-01-2016: C7A.094, C7A.095, C7A.096, C81.11, C81.12, C81.13, C81.14, C81.15, C81.16, C81.17, C81.18, C81.19, C81.21, C81.22, C81.23, C81.24, C81.25, C81.26, C81.27, C81.28, C81.29, C81.31, C81.32, C81.33, C81.34, C81.35, C81.36, C81.37, C81.38, C81.39, C81.41, C81.42, C81.43, C81.44, C81.45, C81.46, C81.47, C81.48, C81.49, C81.70, C81.71, C81.72, C81.73, C81.74, C81.75, C81.76, C81.77, C81.78, C81.79, D3A.094, D3A.095, D3A.096  
- Added ICD Codes: C96.20, C96.21, C96.22, C96.29  
- Removed ICD Code: C96.2  
- Updated Coding notations. |
| 10-01-2017 | - Added HCPCS Codes: A9515, A9587, A9588, A9598  
- Added ICD Codes: C96.20, C96.21, C96.22, C96.29  
- Removed ICD Code: C96.2  
- Updated Coding notations. |
| 10-01-2018 | - Added ICD-10 Codes: C43.111, C43.112, C43.121, C43.122, C4A.111, C4A.112, C4A.121, C4A.122, D03.111, D03.112, D03.121, D03.122  
- Removed ICD-10 Codes: C43.11, C43.12, C4A.11, C4A.12, D03.11, D03.12 |

**REFERENCES**


Other References
1. Blue Cross and Blue Shield of Kansas, Medical Advisory Committee meeting, April 24, 2003 (see Blue Cross and Blue Shield of Kansas Newsletter, Blue Shield Report MAC–02-03).
2. Blue Cross and Blue Shield of Kansas, Oncology Liaison Committee meeting, February 18, 2003 (see Blue Cross and Blue Shield of Kansas Newsletter, Blue Shield Report MAC–02-03).
3. Blue Cross and Blue Shield of Kansas, Radiology Liaison Committee meeting, February 11, 2003 (see Blue Cross and Blue Shield of Kansas Newsletter, Blue Shield Report MAC–02-03).
4. MCMC, Medical Care Ombudsman Program (MCOP), August 11, 2006, MCOP ID 1071-0720.
6. Blue Cross and Blue Shield of Kansas Radiology Liaison Committee, February 2009.